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Attorney's Docket No.: 5308-291

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Sheppard et al.
Application No.: 10/758,871
Filed: January 16, 2004
For: **NITRIDE-BASED TRANSISTORS WITH A PROTECTIVE LAYER AND A LOW-DAMAGE RECESS AND METHODS OF FABRICATION THEREOF**

Confirmation No.: 6572
Group Art Unit: 2815
Examiner: N. Drew Richards

Date: June 8, 2005

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT UNDER 37 C.F.R. § 1.97(b)

Sir:

Attached is a list of documents on Form PTO-1449 together with a copy of any listed foreign patent document and/or non-patent literature. A copy of any listed U.S. patent and/or U.S. patent application publication is not provided herewith in accordance with the amendment by the U.S. Patent and Trademark Office to 37 C.F.R. § 1.98(a)(2)(ii) effective October 21, 2004. It is requested that these documents be considered by the Examiner and officially made of record in accordance with the provisions of 37 C.F.R. § 1.56 and Section 609 of the MPEP.

This Information Disclosure Statement is submitted in accordance with 37 C.F.R. § 1.97(b), within three months of the filing date of the above-referenced application or before the mailing of a first Office Action on the merits, whichever event occurs last. Therefore, no fee is believed due. However, the Commissioner is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-0220.

Respectfully submitted,

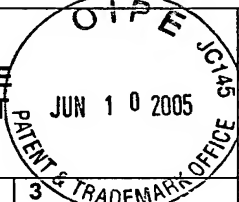
Elizabeth A. Stanek
Registration No. 48,568

Customer No. 20792
Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401

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Erin A. Campion

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| Substitute form 1449A/PTO | |  | | Complete if Known | | |
| INFORMATION DISCLOSURE STATEMENT BY APPLICANT (use as many sheets as necessary) | | Application Number | | 10/758,871 | | |
| | | Filing Date | | January 16, 2004 | | |
| | | First Named Inventor | | Sheppard et al. | | |
| | | Group Art Unit | | 2815 | | |
| | | Examiner Name | | Richards, N. Drew | | |
| Sheet | 1 | of | 3 | Attorney Docket Number | | 5308-291 |

| U.S. PATENTS AND PATENT PUBLICATIONS | | | | | |
|--------------------------------------|----------|----------------------|-------------------------|---|---|
| Examiner Initials* | Cite No. | U.S. Patent Document | | Name of Patentee or Applicant of Cited Document | Date of Publication of Cited Document MM-DD-YYYY |
| | | Number | Kind Code (if known) | | |
| | 1. | US-6,150,680 | | Eastman et al. | 11-21-2000 |
| | 2. | US-6,086,673 | | Molnar | 07-11-2000 |
| | 3. | US-5,686,737 | | Allen | 11-11-1997 |
| | 4. | US-4,755,867 | | Cheng | 07-05-1988 |
| | 5. | US-2004/0241970 | A1 | Ring | 12-02-2004 |
| | 6. | US-2003/0123829 | A1 | Taylor | 07-03-2003 |
| | 7. | US-2002/0167023 | A1 | Charvarkar et al. | 11-14-2002 |
| | 8. | US-2002/0008241 | A1 | Edmond et al. | 01-24-2002 |
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| FOREIGN PATENT DOCUMENTS | | | | | | | |
|--------------------------|----------|-------------------------|--------------|-------------------------|---|---|----------|
| Examiner Initials* | Cite No. | Foreign Patent Document | | | Name of Patentee or Applicant of Cited Document | Date of Publication of Cited Document MM-DD-YYYY | T |
| | | Office | Number | Kind Code (if known) | | | |
| | 9. | EP | 0 334 006 | A1 | Siemens AG | 09-27-1989 | |
| | 10. | JP | 2004-342810 | | Fujitsu Ltd. | 12-02-2004 | Abstract |
| | 11. | JP | 11261053 | | Furukawa Electric Co. Ltd. | 09-24-1999 | Abstract |
| | 12. | PCT | WO 04/008495 | | Cree, Inc. | 01-22-2004 | |
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| OTHER NON PATENT LITERATURE DOCUMENTS | | | | |
|---------------------------------------|----------|--|---|--|
| Examiner Initials* | Cite No. | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published | T | |
| | 13. | Ando et al., "10-W/mm AlGaIn-GaN HFET With a Field Modulating Plate," <i>IEEE Electron Device Letters</i> , 24(5), pp. 289-291 (May 2003). | | |
| | 14. | Chang et al., "AlGaIn/GaN Modulation-Doped Field-Effect Transistors with an Mg-doped Carrier Confinement Layer," <i>Jpn. J. Appl. Phys.</i> , 42:3316-3319 (2003). | | |
| | 15. | Chini et al., "Power and Linearity Characteristics of Field-Plagted Recessed-Gate AlGaIn-GaN HEMTs," <i>IEEE Electron Device Letters</i> , 25(5), pp. 229-231 (May 2004). | | |
| | 16. | Cho et al., "A New GaAs Field Effect Transistor (FET) with Dipole Barrier (DIB)," <i>Jpn. J. Appl. Phys.</i> 33:775-778 (1994). | | |
| | 17. | Coffie et al., "Unpassivated p-GaN/AlGaIn/GaN HEMTs with 7.1 W/MMF at 10 GHz," <i>Electronic Letters online No. 20030872</i> , 39(19), (September 18, 2003). | | |
| | 18. | Gaska et al., "Self-Heating in High-Power AlGaIn/GaN HFET's," <i>IEEE Electron Device Letters</i> , 19(3), pp. 89-91 (March 1998). | | |
| | 19. | Hikita et al., "350V/150A AlGaIn/GaN Power HFET on Silicon Substrate With Source-via Grouding (SVG) Structure," <i>Electron Devices Meeting, 2004</i> , pp. 803-806, IEDM Technical Digest. IEEE International (Dec. 2004). | | |

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| Examiner Initials* | Cite No. | Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published | T |
| | 20. | Kanaev et al., "Femtosecond and Ultraviolet Laser Irradiation of Graphitelike Hexagonal Boron Nitride," <i>Journal of Applied Physics</i> , 96(8), pp. 4483-4489 (Oct. 15, 2004). | |
| | 21. | Kanamura et al., "A 100-W High-Gain AlGaIn/GaN HEMT Power Amplifier on a Conductive N-SiC Substrate for Wireless Base Station Applications," <i>Electron Devices Meeting, 2004</i> , pp. 799-802, IEDM Technical Digest. IEEE International (Dec. 2004). | |
| | 22. | Karmalkar et al., "Very High Voltage AlGaIn/GaN High Electron Mobility Transistors Using a Field Plate Deposited on a Stepped Insulator," <i>Solid State Electronics</i> , Vol. 45, pp. 1645-52 (2001). | |
| | 23. | Kashahara et al., "Ka-band 2.3W Power AlGaIn/GaN Heterojunction FET," <i>IEDM Technical Digest</i> , pp. 677-680 (2002). | |
| | 24. | Komiak et al., "Fully Monolithic 4 Watt High Efficiency Ka-band Power Amplifier," <i>IEEE MTT-S International Microwave Symposium Digest</i> , Vol. 3, pp. 947-950 (1999). | |
| | 25. | Küsters et al., "Double-Heterojunction Lattice-Matched and Pseudomorphic InGaAs HEMT with δ -Doped InP Supply Layers and p-InP Barrier Enhancement Layer Grown by LP-MOVPE," <i>IEEE Electron Device Letters</i> , 14(1), (January 1993). | |
| | 26. | Manfra et al., "Electron Mobility Exceeding 160 000 cm ² /V s in AlGaIn/GaN Heterostructures Grown by Molecular-beam Epitaxy," <i>Applied Physics Letters</i> , 85(22), pp. 5394-96 (Nov. 29, 2004). | |
| | 27. | Manfra et al., "High Mobility AlGaIn/GaN Heterostructures Grown by Plasma-assisted Molecular beam epitaxy on Semi-Insulating GaN Templates Prepared by Hydride Vapor Phase Epitaxy," <i>Journal of Applied Physics</i> , 92(1), pp. 338-345 (July 1, 2002). | |
| | 28. | Manfra et al., "High-Mobility AlGaIn/GaN Heterostructures Grown by Molecular-beam Epitaxy on GaN Templates Prepared by Hydride Vapor Phase Epitaxy," <i>Applied Physics Letters</i> , 77(18), pp. 2888-2890 (Oct. 30, 2000). | |
| | 29. | Parikh et al., "Development of Gallium Nitride Epitaxy and Associated Material-Device Correlation for RF, Microwave and MM-wave Applications," Cree, Inc. (35 slides). | |
| | 30. | Saxler et al., "III-Nitride Heterostructures on High-Purity Semi-Insulating 4H-SiC Substrates for High-Power RF Transistors," International Workshop on Nitride Semiconductors (July 19, 2004). | |
| | 31. | Shiojima et al., "Improved Carrier Confinement by a Buried p-Layer in the AlGaIn/GaN HEMT Structure," <i>IEICE Trans. Electron.</i> , E83-C(12), (December 2000). | |
| | 32. | "Thick AlN template on SiC substrate – Novel semi insulating substrate for GaN-based devices," © 2003 by TDI, Inc., http://www.tdii.com/products/AlN_SiCT.html . | |
| | 33. | Tilak et al., "Influence of Barrier Thickness on the High-Power Performance of AlGaIn/GaN HEMTs," <i>IEEE Electron Device Letters</i> , 22(11), pp. 504-506 (Nov. 2001). | |
| | 34. | United States Patent Application entitled "Improved Dielectric Passivation for Semiconductor Devices," Serial No. 10/851,507, filed May 22, 2004 (Cree Docket No. P0274). | |
| | 35. | United States Patent Application entitled "Silicon Carbide on Diamond Substrates and Related Devices and Methods," Serial No. 10/707,898, filed January 22, 2004 (Cree Docket No. P0387). | |
| | 36. | United States Patent Application entitled "Methods of Fabricating Nitride-Based Transistors with a Cap Layer and a Recessed Gate," Serial No. 10/897,726, filed July 23, 2004 (Attorney Docket No. 5308-392). | |
| | 37. | United States Patent Application entitled "High Power Density and/or Linearity Transistors," Serial No. 11/005,107, filed December 6, 2004 (Attorney Docket No. 5308-511). | |
| | 38. | United States Patent Application entitled "Field Effect Transistors (FETS) Having Multi-Watt Output Power at Millimeter-Wave Frequencies," Serial No. 11/005,423, filed December 6, 2004 (Attorney Docket No. 5308-512). | |
| | 39. | United States Patent Application entitled "Group III Nitride Field Effect Transistors (FETs) Capable of Withstanding High Temperature Reverse Bias Test Conditions," Serial No. 11/080,905, filed March 15, 2005 (Attorney Docket No. 5308-516). | |
| | 40. | United States Patent Application entitled "Aluminum Free Group III-Nitride Based High Electron Mobility Transistors and Methods of Fabricating Same," Serial No. 11/118,575, filed April 29, 2005 (Attorney Docket No. 5308-543). | |
| | 41. | United States Patent Application entitled "Binary Group III-Nitride Based High Electron Mobility Transistors and Methods of Fabricating Same," Serial No. 11/118,675, filed April 29, 2005 (Attorney Docket No. 5308-544). | |

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| | 42. | United States Patent Application entitled "Composite Substrates of Conductive And Insulating or Semi-Insulating Group III-Nitrides For Group III-Nitride Devices," Serial No. 11/103,127, filed April 11, 2005 (Attorney Docket No. 5308-551). | | |
| | 43. | United States Patent Application entitled "Thick Semi-Insulating or Insulating Epitaxial Gallium Nitride Layers and Devices Incorporating Same," Serial No. 11/103,117, filed April 11, 2005 (Attorney Docket No. 5308-553). | | |
| | 44. | United States Patent Application entitled "Cap Layers and/or Passivation Layers for Nitride-Based Transistors, Transistor Structures and Methods of Fabricating Same," Serial No. 10/996,249, filed November 23, 2004 (Attorney Docket No. 5308-373). | | |
| | 45. | Walker, J. L. B. (Ed.), <i>High Power GaAs FET Amplifiers</i> , Norwood, MA: Artech House, pp. 119-120 (1993). | | |
| | 46. | Wu et al., "3.5-Watt AlGaIn/GaN HEMTs and Amplifiers at 35 GHz," IEDM-2003, Cree, Inc. | | |
| | 47. | Wu et al., "3.5-Watt AlGaIn/GaN HEMTs and Amplifiers at 35 GHz," Cree Santa Barbara Technology Center, Goleta, CA 93117. | | |
| | 48. | Wu et al., "30-W/mm GaN HEMTs by Field Plate Optimization," <i>IEEE Electron Device Letters</i> , 25(3), pp. 117-119 (March 2004). | | |
| | 49. | Wu et al., "Bias-dependent Performance of High-Power AlGaIn/GaN HEMTs," <i>IEDM Technical Digest</i> , p. 378-380 (2001). | | |
| | 50. | Wu et al., "Linearity Performance of GaN HEMTs With Field Plates," DRC 2004, Cree, Inc. | | |
| | 51. | Wu et al., "Linearity Performance of GaN HEMTs With Field Plates," Cree Santa Barbara Technology Center, Goleta, CA 93117. | | |
| | 52. | Yu et al., "Schottky Barrier Engineering in III-V Nitrides via the Piezoelectric Effect," <i>Applied Physics Letters</i> , 73(13), pp. 1880-1882 (Sept. 28, 1998). | | |
| | 53. | Zhang et al., "High Breakdown GaN HEMT with Overlapping Gate Structure," <i>IEEE Electron Device Letters</i> , 21(9), pp. 421-423 (September 2000). | | |

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|--------------------|--|-----------------|--|
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